

Investigation of Aspiration Pneumonia and Respiratory Tract Complications in Cases Presenting to the Emergency Service with Intoxication: A Prospective Study

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Abstract

Aim: In this study, we aimed to investigate the frequency of aspiration pneumonia (AP) and factors affecting AP development in patients presenting to the emergency department with intoxication.

Materials and Methods: This single-center prospective study was conducted during one year in patients admitted to the emergency service of a tertiary hospital for intoxication within the first two hours. The data obtained during the study were analyzed statistically using the Statistical Package for Social Sciences (SPSS version 22.0). The results were expressed as mean \pm standard deviation. Univariate statistical analysis was performed using chi-square test for categorical variables and Mann-Whitney U test for non-parametric data.

Results: Of the 50 acute poisoning cases included in the study, pneumonia developed in two cases (4%) in the study group within the first seven days and none of the patients in the control group had AP or respiratory complications. No significant difference was found between the study group and the control group in terms of AP development ($p=0.113$).

Conclusion: Based on the results of this study, it was considered that gastric lavage and activated charcoal administration were more closely associated with AP development in patients presenting with intoxication compared other AP risk factors such as age, lower Glasgow coma scale, and antidepressant or antipsychotic overdose. Therefore, emergency physicians should be sensitive to such cases in order to reduce the duration of treatment and hospitalization of these patients.

Keywords: Aspiration pneumonia, intoxication, gastric lavage, activated charcoal

Introduction

Aspiration pneumonia (AP) is defined as acute lung infection following aspiration of high-pH oropharyngeal or upper gastrointestinal contents (1). The protective mechanisms deteriorate in case of altered consciousness that may occur in intoxication, gastric irrigation and activated charcoal administration; resulting in aspiration. In this study, we aimed to investigate the frequency of AP and the factors affecting AP development in patients presenting to the emergency department with intoxication.

Materials and Methods

For this single-center prospective study, the ethics committee approval was obtained from the Clinical Trials Ethics Commission (2011-61/2). The study was conducted during one year in patients admitted to the emergency service of a tertiary hospital for intoxication within the first two hours. The study group consisted of 50 patients with intoxication who underwent gastric lavage and activated charcoal administration in the emergency department, and the control group included 30 people who were referred to the same service with non-intoxication complaints and who did



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not undergo gastric lavage or activated charcoal administration. Written informed consent was obtained from patients who agreed to participate in the study. Cases associated with corrosive substances or inhalation, those under the age of 18 and those who did not agree to participate in the study were excluded (Figure 1).

Age, gender, absence or presence of risk factors for AP, time between intoxication and presentation to the emergency service, state of consciousness at admission, poisoning agent, complaints, vital signs, glasgow coma scale (GCS), treatment method, need for intubation, physical examination-laboratory findings within the first seven days and chest radiographs were recorded.

In the study group, the presence of at least one of the findings of rales, rhonchi, wheezing and purulent secretion on physical examination and leukocytosis in laboratory tests within the first seven days in addition to detection of infiltration on chest radiography were accepted as AP (2).

The data obtained during the study was analyzed statistically using the Statistical Package for Social Sciences (SPSS version 22.0). The results were expressed as mean \pm standard deviation. Univariate statistical analysis was performed using chi-square test for categorical variables and Mann-Whitney U test for non-parametric data.

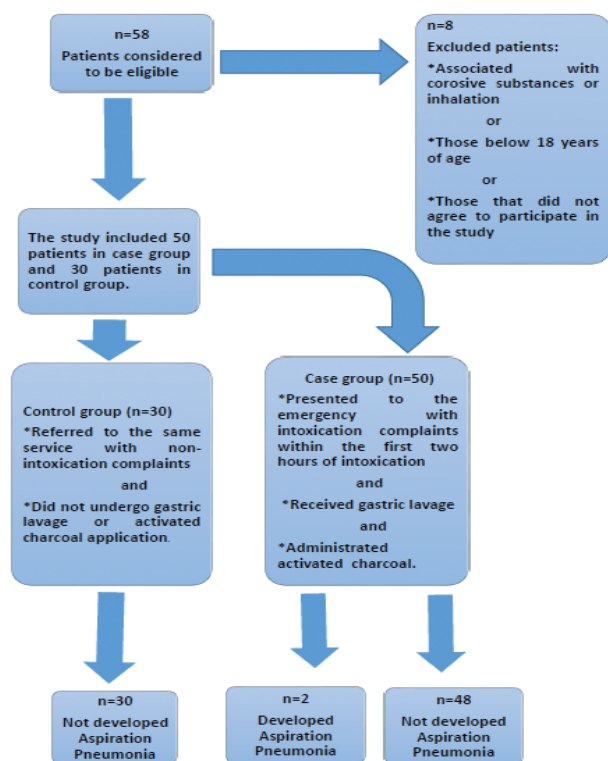


Figure 1. Flow chart

Results

Of the 50 acute poisoning cases included in the study, 80% (n=40) were female and 20% (n=10) were male. The age of the patients ranged from 18 to 76 years and the overall mean age was 28.12 ± 11.20 years, with a mean age of 27.3 ± 11.64 years in females and 30 ± 9.56 years in males. Pneumonia developed in two patients (4%) in the study group within the first seven days, and none of the patients in the control group had AP or respiratory complications.

The cause of intoxication was noted as non-steroidal anti-inflammatory drugs or paracetamol in 38% (n=19), antidepressants or antipsychotics in 34% (n=17), antihypertensive drugs in 10% (n=5) and other drugs in 14% (n=7). The active substance of the drug could not be identified in the remaining two patients (4%).

The complaints of the patients in the study group were nausea in 44% (n=22), drowsiness in 22% (n=11), abdominal pain in 10% (n=5), palpitation in 4% (n=2), clouding of consciousness in 14% (n=7) and other symptoms in 6% (n=3).

Regarding vital signs of the intoxication cases, the mean systolic blood pressure was 110.3 ± 18.25 mmHg and diastolic blood pressure was 69 ± 12.49 mmHg. The mean heart rate was 89.66 ± 14.78 beats per minute (bpm), with 89.43 ± 15.65 bpm for women and 90.6 ± 11.28 bpm for men. Of the 50 cases, 14 (28%) were followed up in the emergency department and 36 (72%) were hospitalized for treatment. Of the 36 patients admitted to the hospital, 29 (80.5%) were treated in the internal medicine service and seven (19.5%) were treated in the intensive care unit (Table 1).

In the control group, 56% of the patients (n=17) were female and 44% (n=13) were male. No pneumonia findings were detected in the first seven days in this group. The mean age of the control group was 33.77 ± 13.86 years; with a mean age of 34.12 ± 12.43 years for women and 33.42 ± 11.25 years for men. For these patients, the reason for referral to the emergency department was headache in 40% (n=12), nausea and vomiting in 36% (n=11), minor trauma in 10% (n=3) and other causes in 13% (n=4).

In the group presenting to the emergency service with drug intoxication, GCS was 12 in two patients (4%), 13 in five patients (10%), 14 in six patients (12%), and 15 in 37 patients (74%). The GCS did not drop below 8 in any of the patients at admission or during follow-up and there were no problems with the preservation of the respiratory system, so intubation was not required for any of the patients.

All cases of acute intoxication were treated with gastric lavage and activated charcoal. The mean age was calculated as 26 ± 13

years in patients without AP and 49.25±21 years in AP patients. It was determined that the patients who developed AP had an overdose of antidepressants and antipsychotics. In two AP cases, the GCS was 12. Eighty-six percent of drug intoxication

Table 1. Patient characteristics

Variable	Cases (n=50)
Age, years (min-max, mean age)	18.0-76.0, 28.12±11.20
Gender	
Female	80% (n=40)
Male	20% (n=10)
The causes of intoxication	
NSAIDs or paracetamol	38% (n=19)
Antidepressants or antipsychotics	34% (n=17)
Antihypertensive drugs	10% (n=5)
Other drugs	14% (n=7)
Unidentified	4% (n=2)
The complaints of the patients	
Nausea	44% (n=22)
Drowsiness	22% (n=11)
Abdominal pain	10% (n=5)
Palpitation	4% (n=2)
Clouding of consciousness	14% (n=7)
Other	6% (n=3)
Vital signs of the intoxication cases	
Mean systolic blood pressure (mmHg)	110.3±18.25
Diastolic blood pressure (mmHg)	69±12.49
Mean heart rate (beat/min)	89.66±14.78
Hospitalization	
Treated in the emergency department	28% (n=14)
Treated in the internal medicine service	58% (n=29)
Treated in the intensive care unit	14% (n=7)
Glasgow coma scale	
12	2 (4%)
13	5 (10%)
14	6 (12%)
15	37 (74%)

NSAIDs: Nonsteroidal anti-inflammatory drugs

Table 2. The rate of aspiration pneumonia development in patients that presented to the emergency service with intoxication and treated with gastric lavage and activated charcoal

		Study group (n=50) (%)	Control group (n=30) (%)	p
AP	Present	2	0	0.113
	Absent	48	30	
	Total	50	30	

AP: Aspiration pneumonia

cases (n=43) were in the 18-40 years age group. Radiological, laboratory or physical examination findings supporting AP were present in two cases (4%) with acute intoxication.

As a result of this study, no significant difference was found between the intoxication group including patients admitted to the emergency service with intoxication and treated with gastric lavage and activated charcoal, and the control group who did not undergo any procedures in terms of AP development (p=0.113) (Table 2).

Discussion

In two different studies investigating acute intoxication cases associated with drug overdose, the frequency of AP has been reported as 29-50% (3,4). In most cases of intoxication, it is not possible to know what type of substance(s) the patients had been exposed to at the time of presentation to the emergency service, immediate intervention and treatment (5). One of the primary objectives in the treatment of acute intoxication is to remove the toxic substance from the patient's body (6). For this purpose, irrigation of the stomach is an important treatment step to be undertaken within 30 minutes to one hour in symptomatic patients who have ingested the poison orally (7). However, gastric irrigation is contraindicated in cases where intoxication is caused by smaller amount of drugs, corrosive substances and hydrocarbons, and when there is a long period between intoxication and referral to the hospital and the airway is not well protected (8).

Pulmonary complications of gastric content aspiration are divided into three groups as particle-related, acid-related, and bacterial. Although the characteristic radiographic localization of AP may be observed in all segments of bedridden patients, it is most commonly seen in the upper segments of the lower lobes and the posterior segments of the upper lobes. However, it mostly develops in the basal segments of the lower lobes in non-bedridden patients (8). Sometimes bilateral or interstitial patterns may be seen. On chest radiographs, the findings are non-specific and may not be detected within a few hours (9). It may take 48-72 hours for the infiltration to become radiographically visible.

AP is not common in cases of acute intoxication, but it significantly increases mortality and morbidity (10). The diagnosis of AP is based on the presence of an infiltrative appearance on chest radiography accompanied by one of the clinical signs or risk factors of AP (11). In different studies, the rate of AP in acute intoxication cases was reported to be between 1.6% and 29%. In one study, the rate of AP development was reported as 29% in patients presenting with drug overdose (12). In another study by Isbister et al. (10), who examined 4,562 acute intoxication cases,

AP development rate was calculated as 1.6%. This rate was 4% in our study.

The risk of AP development is higher in older age than in younger people (8). It has been reported that dysphagia and dysmotility may be the causative agents in elderly patients with higher incidence of AP (13). Isbister et al. (10) noted the mean age as 44 years for patients with AP and 33 years for those who did not develop this complication. In the current study, patients over 40 years of age constituted 12% of all cases and 75% of patients who developed AP. We determined that the mean age of the patients with and without AP was 49.25 ± 21 and 26 ± 13 years, respectively.

There are many publications suggesting a close relationship between reduced consciousness and aspiration. It has been reported that the risk of AP development increases with decreased consciousness (14). Adnet and Baud (12) found that the rate of AP was 29% in drug overdose cases and that 85% had GCS below 15. Isbister et al. (10) reported that 95.9% of the acute intoxication cases had a GCS of 15 and that AP rate was 1.6%. The coughing and retching reflexes are important in protecting the patient from aspiration. These reflexes can be suppressed by altered level of consciousness. However, the relationship between the GCS and protective reflexes remains unclear. In their study, Adnet and Baud (12) reported that seven of 12 patients with a GCS of 3 had an intact cough reflex and that there was no relationship between the GCS and protective reflexes. In contrast, in another study, it was found that the retching reflex was not maintained even in cases with a relatively high GCS and that 15.4% of the patients with a GCS of 9 to 14 presented with symptoms indicative of AP (15). In cases where the airway is not well protected, the risk of AP increases despite high GCS values (12). In our study, two patients that developed AP had a GCS of 12, which is consistent with the literature.

In acute intoxication cases, gastric lavage is used to remove the toxic substance from the body. A review argues that the gastric lavage should not be done routinely for the treatment of poisoned patients and that it should only be done by appropriately trained or expert persons in rare cases where gastric lavage is required (16). It has been reported that endotracheal intubation is important in the prevention of aspiration in coma patients and that it should be taken as a preventive measure in patients with a GCS of 8 or below (17). The sample of the current study included patients referred to the emergency service within two hours, as this was the maximum period for the administration of activated charcoal. The lowest GCS was 12 and therefore, there was no need for intubation in any patient at admission or during follow-up (18).

Improper placement of a nasogastric tube also increases the risk of aspiration (8). In a study by Karataş (19), 3.4% of

patients without nasogastric tube developed AP, but the rate of this complication increased threefold (10.7%) in cases where nasogastric tube was used. In the current study, the rate of AP development was determined as 4% in patients who underwent nasogastric intubation and activated charcoal administration.

Although activated charcoal is generally regarded as an inert substance, experimental research has shown that aspirated activated charcoal can cause parenchymal injury or bronchiolar obliteration in the lungs (16). Despite being rare, aspiration of activated charcoal results in a clinical picture that leads to respiratory failure and even death, and therefore, activated charcoal should not be administered to patients before initial checking and airway protection. In a study of patients who were poisoned with tricyclic antidepressants, activated charcoal was detected in bronchial secretions of one-fourth of the intubated cases (20). Some complications of activated charcoal in the gastrointestinal system have also been shown to be associated with aspiration (21).

Spontaneous or conscious vomiting is common in patients with acute intoxication. Vomiting is a protective reflex, as well as a treatment method in this patient group. Eighteen percent of the patients in our study vomited at least once at admission or after admission to the emergency service. However, there was no significant difference in AP development between the groups with and without a history of vomiting.

Study Limitations

The most important limitation of the study is related to single-center design. Another limitation is that all patients had a GCS of 12 or above. Furthermore, due to the sample selection criterion of referral to the emergency department within the first two hours for the administration of gastric lavage and activated charcoal, the toxic effect of the ingested drug was not sufficient to further reduce GCS. Another factor for higher GCS may be the developed prehospital health services and transportation facilities in our province, possibly reducing the time between intoxication and admission to the hospital.

Conclusion

In this study, there was no significant difference between the study group that presented to our emergency service with intoxication and received gastric lavage and activated charcoal and the control group in terms of the risk of AP development. However, two patients that developed AP were older and had a lower GCS than the patients without AP. In addition, both AP cases were intoxicated by antidepressants and antipsychotics. Therefore, physicians should consider the possibility of AP development in cases of advanced age, lower GCS, and

antidepressant or antipsychotic overdose. It should also be remembered that although the possibility of AP development is higher in patients with a GCS of 8, this complication can also occur in individuals with a normal level of consciousness, and that endotracheal intubation may not always fully protect the respiratory tract. Unnecessary nasogastric tube insertion, gastric lavage and activated charcoal administration can also increase the risk of AP development in acute intoxication cases.

Based on the results of this study, it is considered that gastric lavage and activated charcoal administration are more closely associated with development of AP compared to the other AP risk factors such as age, lower GCS, and antidepressant or antipsychotic overdose in cases presenting with intoxication. Therefore, emergency physicians should be sensitive to such cases in order to shorten the duration of treatment and hospitalization of patients.

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Ethics

Ethics Committee Approval: Haydarpaşa Numune Training and Research Hospital Clinical Trials Ethics Commission (2011-61/2).

Informed Consent: It was taken.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: İ.T., A.D.A., Concept: İ.T., A.D.A., Design: İ.T., A.D.A., Data Collection or Processing: İ.T., A.D.A., Analysis or Interpretation: İ.T., A.D.A., Literature Search: İ.T., A.D.A., Writing: İ.T., A.D.A.

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